JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS-2022

B.Tech-VII Semester (Civil)

COURSE CODE (CREDITS): 18B1WCE735 (3) MAX. MARKS: 35

COURSE NAME: Design of Prestressed Concrete Structures

COURSE INSTRUCTORS: Dr. Saurav MAX. TIME: 2 Hours

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q1. A post tensioned prestress beam of rectangular section 250mm ×580mm is to be designed for an imposed load of 12kN/m uniformly distributed on a span of 12m. The stress in the concrete must not exceed 17N/mm^2 in compression and 1.4 N/mm^2 in tension at any time and the loss of prestress may be assumed to be 15%. Calculate the minimum prestressing force and the corresponding eccentricity using **Magnel's graphical method.** **[6, CO2, 4]**

Q2. A rectangular concrete beam 100mm wide and 250mm deep spanning over 8m is prestressed by a straight cable carrying an effective prestressing force of 250kN located at an eccentricity of 40mm. The beam supports a live load of 12kN/m. **[6, CO2]**

a) Calculate the resultant stress distribution for the central cross section of the beam taking concrete density as 24kN/m^3

b) Find the magnitude of prestressing force with an eccentricity of 40mm which can balance the stresses due to dead and live loads at the bottom fiber of the central section of the beam.

Q3. A pretensioned prestressed concrete beam 400mm×800mm of span 8m is simply supported and initially subjected to a prestressing force of 2500kN provided at a constant eccentricity of 160mm. Area of steel provided is 1750mm^2. The beam is subjected to a live load of 40kN/m. Calculate the loss of prestress due to various reasons. Use M50 Grade of concrete, creep coefficient ϕ=1.6. **[5, CO3]**

Q4.

i) Deduce an equation to calculate the short term deflection of prestressed beam due to prestressing force alone. Profile of the cable is parabolic having eccentricity e_1 at center below neutral axis and e_2 at the supports above neutral axis. **[6, CO2, 4]**

ii) A concrete beam of 300mm ×500mm is prestressed by 2 post tensioned cables of area 600mm^2 each initially stressed to 1600N/mm^2. The cables are located at a constant eccentricity of 100mm throughout the length of the beam having a span of 10m. **[6, CO2, 4]**

a) Neglecting all losses, find the deflection at the center of the span when it is supporting its own weight.

b) Allowing for 20% loss of prestress, find the final deflection at the center of the span when it carries an imposed load of 18kN/m^3. Given density of concrete = 25kN/m^3, E_c= 38 kN/m^2, E_s= 210 kN/m^2

[6, CO1]

Q5. Write short notes on **any three**

a) Prestressed concrete has improved resistance to shearing force as compared to conventional reinforced cement concrete.

b) Use of high tension wires in prestressing is as compared to conventional RCC

c) Explain with sketches "Hoyer's long line system of Pretensioning"

d) Advantages of Prestressed concrete over conventional RCC

e) Explain steel relaxation and its importance in design of prestressed concrete